REMARKS/ARGUMENTS

Pending Claims

Claims 1, 3, 4, 6 and 8-9 are pending in this application. Claims 2, 5 and 7 have been canceled without prejudice or disclaimer. Claims 1, 3, 4, 6 and 8-9 have been amended. No new matter has been added.

Claim Objections

Claim 4 has been amended to depend from claim 3 thereby providing antecedent support for "the inter-subsystem copy" and "the intra-subsystem copy".

Claim 7 has been canceled and added to claim 6. However, the language of the claim that was objected to has been rewritten as suggested.

Claim 9 has been amended to overcome the objection to the use of the term "each processing of a remote copy."

Claim Rejections under 35 U.S.C. §112

Claim 6 has been amended to overcome the indefiniteness rejection at line 15 by providing for proper antecedent basis for the limitation "each of the other operation sites."

Claim Rejections under 35 U.S.C. §103

Claims 1-3 and 5-9 have been rejected under 35 U.S.C. §103(a) as being unpatentable

over Yanai, U.S. Patent No. 6,173,377. Further, claim 4 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Yanai '377 in view of Coverston, U.S. Patent No. 5,504,883. Applicants request reconsideration of the rejections in view of the foregoing amendments and for the following reasons.

According to the present invention, as shown in Fig. 1, the computer system has a (first) production site 3, (second) local site 4 and (third) remote site 5, in which the production site and the remote site have a host (1a, 1c) and a storage device subsystem (2a, 2c). The local site 3 has a storage device subsystem 2b without a host. Operation of the system is usually executed at the production site with backup to the local site and the remote site. See page 6, lines 13-24 of the specification.

In particular, in the operation of the computer system, the production site remote copies data to the storage device subsystem 2b of local site 3 and the storage device subsystem 2c of remote site 4 using the disaster recovery management program P120 that is stored in the disk unit 108a and read into the memory 102a, to be executed by CPU 101a. Fig. 11 is a flowchart illustrating the processing of the disaster recovery management program P120, which manages the copying of the data to the local site and the remote site. The program P120 updates a copy management information table 600, which is stored in the disk unit 211a of the storage device subsystem 2a of the production site 3 and is copied to the disk units 211b and 211c of local site 4, and then to disk units 211d and 211e of the remote site 5. *See* page 14, lines 2-9 of the specification. Accordingly, it is to be noted that when the copy management table is updated in the steps 1107, 1112, 1117, 1122, 1127, 1132, or 1137, the copy management tables of the

other sites are also updated in synchronization with this updated copy management table. *See* page 21, lines 12-15 of the specification.

Fig. 12 is a flowchart illustrating the processing of the disaster recovery management program R121 which is stored in disk unit 108c and executed when a failure occurs in the production site 3, for example. The disaster recovery management program R121 is read into the memory 102c in the remote site 5, and is then executed by the CPU 101c. *See* page 8, lines 19-21 of the specification, for example. When the program for disaster recovery is executed, , is collected from all of the surviving disk units, which survive after the disaster. *See* page 22, lines 4-7 of the specification.

As set forth in amended claim 1, the computer system has first and third operation sites, each including a host and a storage device subsystem, and a second site having a storage device subsystem that are mutually connected through a network. A copy management program operates in the host of the operation sites and uses copy management information that includes state information to execute remote copy processing from the storage device subsystem of the first operation site to the storage device subsystem of the second site and to the storage device subsystem of the third operation site. As set forth in claim 1, the copy management information is stored in the storage device subsystems of the first, second and third sites and is updated every time a remote copy is executed. When a failure occurs in the first operation site, the copy management information stored in the storage device subsystems is referred by use of the copy management program that operates in a host included in the third operation site to execute copying from a point at which copy processing had progressed before the failure.

In claim 6, a failure recovery method for a computer system having a first operation site, a second site and other operation sites is claimed. The method states that the copy management program operating in the host of the first operation site remote-copies data stored in a storage device of the storage device subsystem of the first operation site to a storage device of a storage device subsystem in the second site and each of the other operation sites. The state of the remote copy is reflected in copy management information stored in the storage device of the storage device subsystem included in the first operation site and every time copy processing is performed, the state of the remote copy is reflected in the copy management information stored in the storage device of the storage device subsystems included in the second site and each of the other operation sites. According to claim 6, when a failure occurs at the first operation site, the copy management information stored in the storage device of the storage device subsystem included in the second site and each of the other operation sites is referred by use of a copy management program that operates in a host included in one of the other operation sites to execute copying from a point to which the copy processing had progressed before the failure.

Claim 9, which is also directed to a computer system, has a production site, a local site and a remote site wherein each site has a storage device subsystem and the production and remote sites further include a host. Copy management information that includes state information of a remote copy is used by a copy management program to execute a remote copy. According to claim 9, the copy management information is kept in a storage device subsystem included in the production site, the local site and in a storage device subsystem included in the remote site. Claim 9 states that when making a remote copy from a storage device subsystem

by use of the copy management program, a host included in the production site updates copy management information of the remote copy by synchronizing the copy management information included in the local site and the remote site with copy management information in the production site. Thereby, when a failure occurs in the production site, the copy management information stored in the storage device of the storage device subsystems included in the local site and in the remote site is referred by use of a copy management program that operates in a host included in the remote site to execute copying from a point to which the copy processing had progressed before the failure.

As amended, none of the independent claims 1, 6 and 9 is anticipated by Yanai. In particular, Yanai discloses a computer system which controls storing of primary data received from a primary host computer on a primary data storage system, and additionally controls the copying of the primary data to a secondary data storage system for providing a back-up copy of the primary data. Preferably, according to Yanai, the secondary data storage system is located in a geographically remote location from the primary data storage system in order to provide for disaster recovery of the data from the remote site. The primary and secondary data storage system controllers are coupled via at least one high speed communication link such as a fiber optic link that also permits one data storage system to read or write data to or from the other data storage system. Accordingly, Yanai merely discloses a computer system providing for remote mirroring of data to enable disaster recovery of data. Data migration is also possible using the system of Yanai.

On the other hand, the computer system and method of the present invention is directed

to a disaster recovery system having a configuration of three or more data centers. In the operation of such a disaster recovery system, it is necessary to provide copy management information that includes state information that is used by a copy management program to execute remote copy processing from the storage device subsystem to each of the other two sites, such as a local site and a remote site. When a failure occurs in the production site, the copy management information stored in the storage device of the storage device subsystems included in each of the local site and the remote site is referred by the copy management program that operates in a host included in the other production site, such as the remote site, to execute copying from a point to which the copy processing had progressed before the failure. Yanai does not disclose the storing of management information in each storage device subsystem of a production site, local site and remote site, and further does not disclose using a copy management program to execute copying from the remote site (third or other site), after a failure occurs in the production site (first site), as claimed by Applicants.

Yanai discloses remote mirroring and also mentions, as pointed out in the Office Action, that the primary and secondary volumes can be locally mirrored for enhanced redundancy, citing col. 13, lines 62-65 of Yanai. However, the reference does not disclose or suggest making make an inter-subsystem copy of data stored in a storage device between the storage device subsystems of a first operation site and a second site, and of a second site and a third operation site; and an intra-subsystem copy of data stored in a storage device in the storage device subsystem of the second site and in a storage device of the storage device subsystem in the third operation site, as claimed by Applicants in claim 3. Claim 8 also sets forth

inter-subsystem copying of data and intra-subsystem copying of data in a storage device, which is likewise not suggested by Yanai. Accordingly, Yanai does disclose the claimed combination of dependent claims 3 and 8. For the foregoing reasons, the rejection under 35 U.S.C. § 102 should be withdrawn..

With regard to claim 4, Yanai does not disclose that the copy management information includes state information about the inter-subsystem copy, state information about the intra-subsystem copy, and time stamp information about the time at which the copy management information is written, as claimed. The Office Action relies upon Coverston for disclosing time stamps that are used in the recovery of a file system in the event of a hard stop of the computer system. In particular, the file system of Coverston uses control information that is maintained in a cache memory that is backed up to two separate logical devices in a secondary storage system. The time stamp information is used to validate the backup data. However, the disclosure of Coverston is insufficient when combined with Yanai to render the invention as set forth in claim 4, which depends from claim 3 and base claim 1, unpatentable under 35 U.S.C. § 103(a). Accordingly, withdrawal of the rejection is respectfully requested.

Conclusion

In view of the foregoing, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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